

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

RESIDUE MANAGEMENT

CODES 329 and 345

SPECIFICATIONS

What is Residue Management and Conservation Tillage?

Residue Management is managing the amount, orientation and distribution of crop and other plant residue on the soil surface throughout the year. It includes all soil disturbing activities like tillage, nutrient applications and harvesting of residue. Residue management systems can be designated to accomplish multiple purposes including:

- Reduced sheet and rill erosion
- Maintain or increase soil organic matter
- Increase moisture available for plant use
- Reduce energy use
- Reduce soil particulate emissions and CO₂ losses
- Provide food and escape cover for wildlife

Two important definitions to remember when talking about residue management activities include Soil Condition Index (SCI) and Soil Tillage Intensity Rating (STIR). Both are used in the RUSLE2 program and are defined as:

SCI – a numerical value calculated using RUSLE2. SCI predicts the effects of management systems on soil organic matter content. Soil organic matter level is a primary indicator of soil condition. It affects soil characteristics and processes such as cation exchange, aggregate stability, water holding capacity, and soil biological activity. Soil condition is the degree to which a soil maintains the ability to accept, store and release water, nutrients, and energy, to promote and sustain root growth, soil biological and chemical processes, resist erosion, compaction, and other management impacts.

STIR - a numerical value calculated using RUSLE2 that is based on factors determined by

crop management decisions being implemented for a particular field. The specific components of the STIR value include the operational speed of tillage equipment, tillage type, depth of tillage operation, and the percent of soil surface area disturbed. Values may range from 0-200, with lower scores indicating less soil disturbance.

Conservation tillage is any tillage system that leaves at least 30% crop residue cover after planting or during a residue management period. The 30% figure represents residue cover that will typically provide adequate soil protection from erosion, with additional residue cover resulting in ‘diminishing returns’ in soil erosion reductions. There are two types of residue tillage regimes that manage residue for sustainable agricultural production:

- Residue and Tillage Management, No Till
- Residue and Tillage Management, Reduced Till

These two residue management systems have been proven to improve soil condition over traditional tillage methods. There are several distinct differences between these practices, however.

Residue and Tillage Management, No Till

This is the ‘Cadillac’ of residue management strategies. This system disturbs the least amount of residue because crops are either planted directly into previous year’s residue, cover crop residue, or small strips or slots. Key points of No Till/Strip Till include:

- No full width tillage can be performed. In-row soil tillage during the planting operation is acceptable.

- Allowances can be made to level ruts or perform deep tillage to alleviate hard pans.
- The STIR, as calculated by the RUSLE2 program, cannot exceed 20 under any circumstances.
- Residue cannot be burned under any circumstances.
- This system is not applicable to sugarcane production systems.
- Weed control is almost exclusively achieved with herbicides.

Residue and Tillage Management, Reduced Till

Reduced Till systems manage the amount, orientation and distribution of crop and other residue on the soil surface while limiting the soil disturbing activities used to grow and harvest crops in systems where the field surface is tilled prior to planting. This standard is the combination of Residue Management, Seasonal (344), Residue Management, Mulch Till (345), and Residue Management, Ridge Till (346). This standard captures all conservation tillage systems that involve full-width tillage. The term 'ridge' in this system refers to hipped rows in a row-crop farming system. The furrows are the dips between rows. Key points of Reduced Till are:

- Seedbed preparation, planting, fertilizer applications, and cultivation shall not exceed a STIR rating of 80 and the Soil Condition Index (SCI) should be positive. Soil loss is kept below 'T' tolerance level. These three parameters must be calculated using the RUSLE2 program.
- Residue shall not be burned, except as noted for sugarcane.
- Weed control is achieved with a combination of cultivation and herbicides.

Sugarcane

1. No soil disturbing activities shall occur from harvest of the final ratoon crop until planting of the next sugarcane crop. During the fallow period, volunteer sugarcane and weeds shall be controlled by preplant herbicides (burndowns and/or residuals) recommended by the LSU Agricultural Center. If soybeans or other warm season annuals are grown during the fallow period,

seedbed preparation start dates are limited to the dates in the table below. No other soil disturbing activities are allowed until planting operations for sugarcane commence as described in the next item.

2. Planting (including hipping, opening, planting, covering and packing) shall be accomplished within 21 days of the initial soil disturbing activity.
3. Planting shall be accomplished within dates recommended for sugarcane by the LSU Agricultural Center.
4. Ridge height following planting shall be a minimum of 10 inches.
5. Row cleaning, herbicide incorporation, and fertilizer placement shall disturb no more than 24 inches across the top of the row.
6. Following harvest, crops residue may be left undisturbed, moved to the furrows with a row cleaner or similar implement which does not disturb more than 24 inches across the top of the row or bury the residue, or burned. If burned, burning shall be conducted according to Louisiana's Smoke Management Guidelines for Harvesting Sugarcane. Sugarcane may be burned pre or post harvest but not both.
7. Weed control shall be accomplished with a combination of herbicides and cultivation.
8. Cultivation for weed control and rebuilding of ridges is limited to 2 passes (in addition to off-bar operation) and shall be accomplished with implements that maintain residue in the surface layer (within top 3 inches).

The earliest dates for beginning seedbed preparation on non-highly erodible cropland are:

Rice	January 15
Corn	February 15
Grain Sorghum	February 15
Cotton	February 15
Soybeans	February 15
Sugarcane	February 15
Oats	September 1
Wheat	September 1
Rye	September 1
Ryegrass	September 1

For both residue management options, carefully read all practice standards and specifications.

Planning and Implementation of Residue Management

Residue management will be planned, with the producer, using past farm records and the RUSLE2 program. All cultural operations from past farming operations will be input into the RUSLE2 model. This will set the 'baseline' measurement of surface residue, soil loss, STIR, and SCI throughout the year. Improvements to cultural operations are then to be input into RUSLE2 to determine if all criteria for residue management system chosen are met. Once the producer and the NRCS conservation planner agree on the plan of cultural operations, this chronological list of planned cultural practices, along with the 'baseline', will be printed out and become part of the conservation plan. The Profile option in RUSLE2 (and not the Worksheet or Plan option) must be used to generate RUSLE2 reports. The report NRCS Profile with SCI STIR Fuel UseLandscape0806.pro.dot (or portrait version) must be selected, as it provides a list of all cultural activities used to generate the soil loss, SCI and STIR.

Follow-up activities to assure that planned residue management and tillage operations meet the minimum criteria will be conducted. At a minimum, residue cover will be reviewed once per year using the line-transect method. Depending on the crops grown and the Residue Management system planned, these times will differ. For most crops in a No till system, transects should be completed immediately following planting activities. For crops grown using a Reduced Tillage system, the best time to complete transects is before spring seedbed preparation activities. Conservation planners must use good judgment in determining when to conduct transects for practice certification. If any questions should arise, the Area or State Conservation Agronomist should be contacted for assistance.

Estimating Residue Cover

The line-transect method is the preferred way to quantify the amount of cover a producer has on his or her field. To conduct this test, field personnel will need a 50' or 100' measuring tape or similar measuring device with at least 100 marks spaced 6" to 12" apart.

Step 1 Find a representative area of the field.

Step 2 Stretch the tape or line diagonally across crop rows and anchor at both ends.

Step 3 Count the residue at the point of each mark of the tape or line. Make sure that the same side of the tape or line is used when counting residue. Count only those marks that have residue exactly under them. Only count residue that is wider than 3/32", as anything smaller will not fully dissipate the energy of a raindrop. If you are unsure, do not count the intersection.

Step 4 Determine the percent cover. When 100 points on a tape are counted, the number of marks over residue gives a direct measurement of the percentage of cover in the field. A count of 32 would equal 32% residue cover.

Step 5 Repeat this procedure in each field under review.

This condensed method was taken from the text Conservation Tillage Systems and Management – Crop Residue Management with No-till, Ridge-till, Mulch-till. First Edition, 1992, and the NRCS National Agronomy Manual, Subpart 503.43

Photos of residue transects borrowed from the NRCS brochure **Farming with Crop Residues** (found in EFOTG, Section IV, Tools):



